

## **Critical Area Coastal Resilience Planning Guide**



**Spring 2016**

**Critical Area Commission for the Chesapeake and Atlantic Coastal Bays**

## **Final Report: Critical Area Coastal Resilience Planning Guide**

**Spring 2016**

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Written under contract for the Critical Area Commission for the Chesapeake and Atlantic Coastal Bays in association with the Chesapeake and Coastal Service (CCS) and Office of Ocean and Coastal Resource Management (OCRM), National Oceanic and Atmospheric Administration (NOAA).

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## INTRODUCTION

While living along Maryland's beautiful shores has many advantages, there has always been some risk to living in a coastal environment. In recent years, coastal hazards have intensified noticeably. Coastal hazards include nuisance flooding, rises in local sea level, increased storm surge and the effect of hardened shorelines on ecosystem adaptation. Scientists anticipate these hazards to continue worsening into the future, undoubtedly affecting the people who live there, as well as existing development and the environment<sup>1</sup>.

Coastal resilience is building up the ability of a community to bounce back after experiencing coastal hazards. Proactive planning can reduce cost and be less time consuming than reacting to the impacts after they occur. When a community improves its resiliency, it potentially reduces economic burden from coastal hazards, as well as negative impacts to the environment, human health, and transportation inconveniences. **It can seem daunting to come up with a plan for improving your community's coastal resilience, but one good place to start is with your Critical Area program and examining your current and future needs. Small steps and best management practices can have a collective positive impact on a community, and will help address coastal hazards into the future.** Below is a simple outline to help guide you in the right direction; it includes questions to consider, and actions to take now. There is also a discussion of potential strategies to implement in light of these coastal hazards, in the form of amendments to your local Critical Area program. The Critical Area staff is available to help you with this process and provide resources.

This guide is intended primarily for planners in small communities and towns, rather than counties, due to the flexibility the smaller geographic area provides. However, for counties interested in pursuing coastal resilience, these concepts are still applicable, and there are other avenues to explore as well. One example is hazard mitigation planning. The Federal Emergency Management Agency (FEMA) defines hazard mitigation as any action taken to reduce or eliminate long-term risk to people and property from natural disasters. Smaller communities and towns may also want to explore this avenue in addition to Critical Area coastal resiliency.

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<sup>1</sup> Sweet, W., J. Park, J. Marra, C. Zervas, S. Gill, 2014. Sea Level Rise and Nuisance Flood Frequency Changes around the United States. NOAA Technical Report NOS CO-OPS 073. U.S. Department of Commerce, National Ocean Service, Center for Operational Oceanographic Products and Services. Silver Spring, MD.



Photo credit: Alex DeWeese. Nuisance flooding the day after a storm in downtown Annapolis, MD.

## **PROCESS & ASSESSMENTS**

### **Anecdotal Assessment**

One of the most important aspects of planning for coastal resilience within a community is to hear personal stories and note specific concerns regarding coastal hazards as well as Critical Area opportunities for improvement. Feedback can come from residents, business owners, educators, town planners and a variety of other stakeholders. Their anecdotes are of particular importance because these people experience life in the community every day, and know when and where problems occur. This personal knowledge is useful to help shape the evolution of coastal resiliency in the community and guides decision making down the road. The role of the town planner will likely be the most important during this process, as they know the daily ins and outs as well as how existing regulations work for or against current and future needs.

Local government staff may wish to hold a forum in order to engage local stakeholders during this part of the process. Plan to hold a few small meetings with members of the community, such as elected officials, business owners, and residential representatives for example. Some sample discussion points are listed below. It may also be helpful to staff and to stakeholders for there to be a map of the community at the meeting, so that specific areas of interest can be identified.

### **Questions and Actions:**

- As a town planner, working with your town council, list your coastal concerns. Discuss and include items such as road closures, park access, flooding, erosion, economic burden, business closures and related impacts, etc.
- Where does flooding occur during heavy rain events? How does this affect traffic, businesses and homeowners?
- Where does flooding occur during high tide events? How does this affect traffic, businesses and homeowners?
- What are the town's short-term and long-term goals and priorities? For example, take note if there is a historical structure of particular importance that is threatened by coastal concerns, or if improving buffers or increasing green space are goals for the town.
- In terms of the town's Critical Area program, are there specific parts that are difficult to implement? Are there specific elements of the program that work particularly well and the community likes?
- What barriers are there to investing in the community?
- Review Oxford's Case Study as an example.

### **Case Study: Oxford's Anecdotal Assessment for Coastal Resiliency**

Road closures due to flooding from both storm events and high tide events are frequent issues in the Town of Oxford. Transportation is a concern because the Causeway, the main roadway into and out of town, floods during and after such events. Businesses and homeowners must also deal with flooding on their properties and in their buildings. One method the Town has developed to let drivers know how deep the floodwater is and if it's safe to drive through are "high-water markers" which are wooden posts painted in different shades of blue; residents familiar with the area know to avoid driving through a specific location if the water level has reached a particular blue shade.

A main priority for the community is maintaining its historic character and green infrastructure. Thus, they have a lot coverage limit of forty percent across the entire

town, even in their Intensely Developed Areas that would typically have no lot coverage limit. This has made it difficult to encourage the use of pervious pavers, which could help with their flooding issues, as they are typically more expensive than usual materials but still contribute to the lot coverage limit.

From our preliminary meeting with officials from the Town of Oxford, we confirmed that most development in the Town of Oxford is redevelopment, with only one new house built per year on average. A Stormwater and Shore Protection (SWSP) Utility was created in 2014 as a result of the Environmental Finance Center's stormwater task force and final report in 2013. With the support of the community, they have set up a utility that will collect approximately \$100,000 each year specifically for stormwater management and shoreline protection. The Town spent \$25,000 in 2014 to do an inventory of their existing stormwater and shoreline infrastructure. They also applied for a grant for coastal projects, such as retention areas to capture and contain stormwater to prevent some of the flooding at the Causeway.



Photo credit: Cheryl Lewis. Flooding of Oxford's causeway.



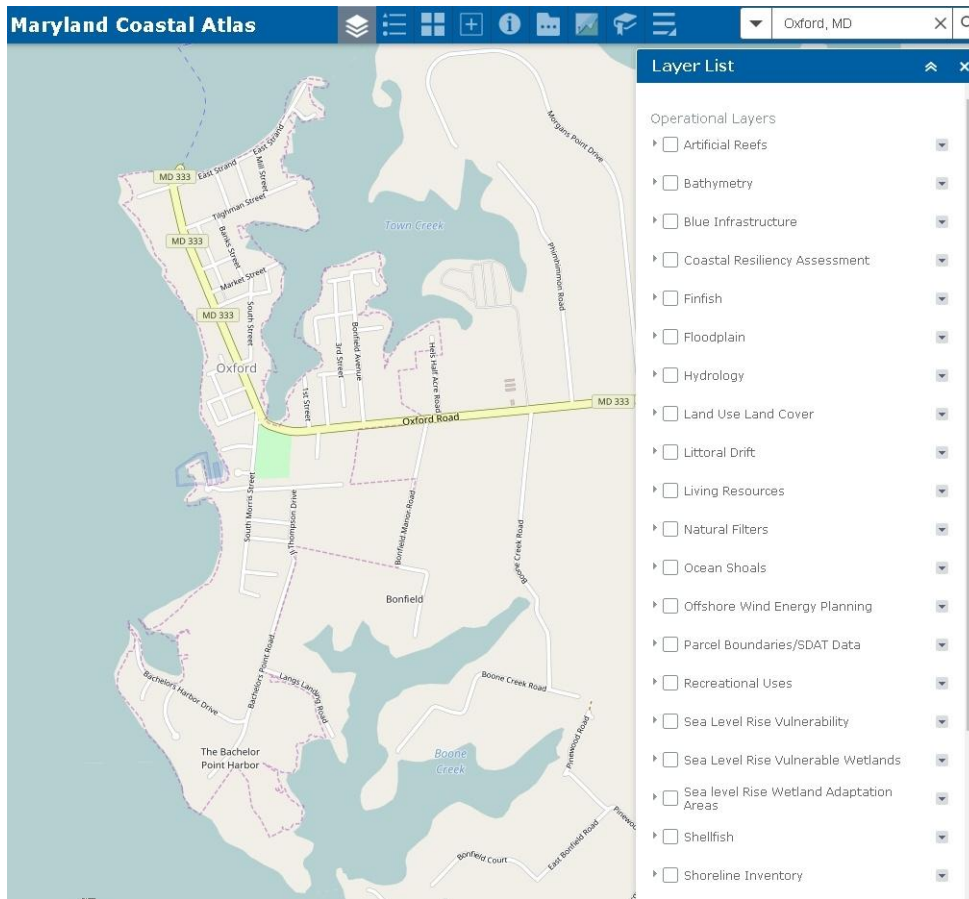
Photo credit: Cheryl Lewis. Oxford "high-water marker" in center of photo.



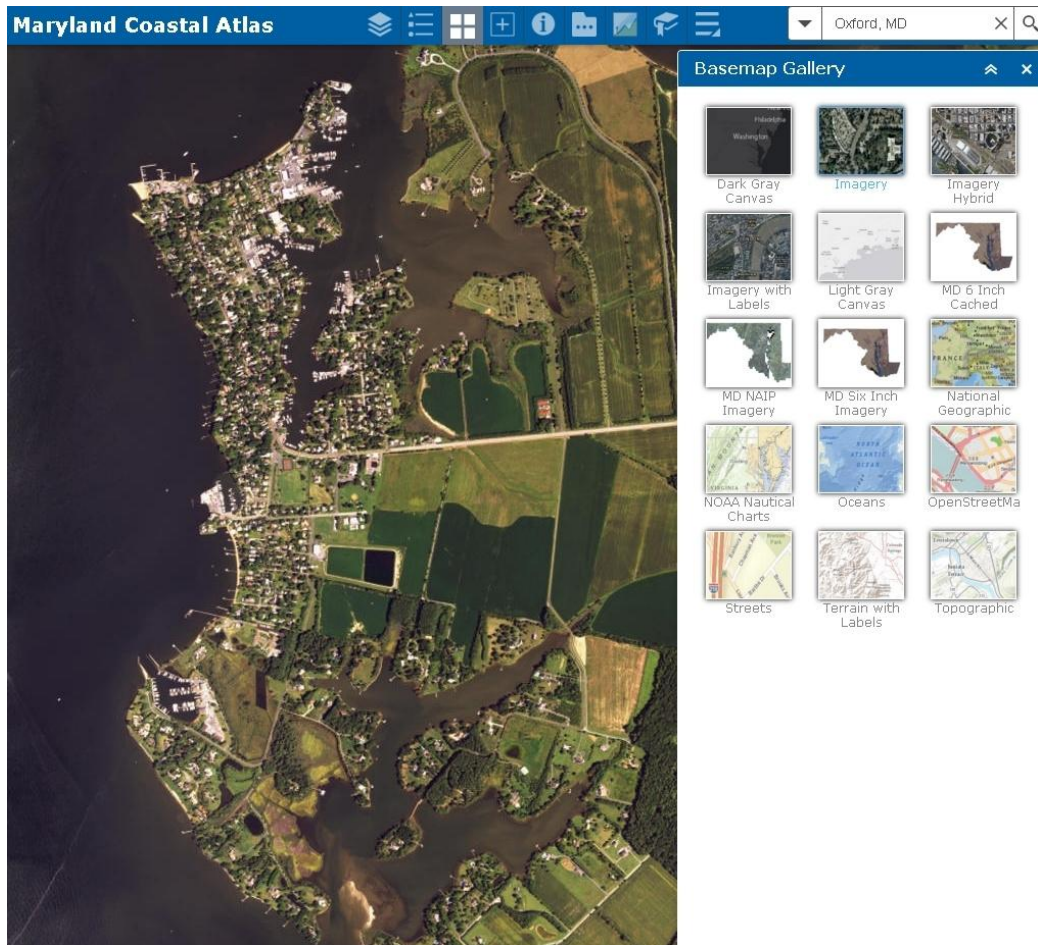
## Geographic Assessment

In addition to the anecdotal assessment, completing a geographic assessment is key to your community resilience plan. Such an assessment can help validate the information provided by stakeholders, identify potential hazards of the future, and assist in identifying specific locations within a community that may need more immediate attention than others. The Maryland Department of Natural Resources has developed a tool called Maryland's Coastal Atlas that allows users to view a variety of coastal hazards and observe their impact within the coastal areas of Maryland. The tool is available here: <http://dnr.maryland.gov/ccs/coastalatlus/>. Similar state and federal mapping resources are available for this part of the process as well, such as Maryland's Environmental Resource and Land Information Network (MERLIN) and the National Oceanic and Atmospheric Administration's (NOAA) Digital Coast Tools, but this example uses Coastal Atlas.

Whether a user is interested in a particular neighborhood or an entire town, Coastal Atlas can provide helpful geographic insight for planning purposes. After panning to the location of interest by typing it into the search bar in the upper right corner of the webpage, click on the "Layer List" icon (looks like sheets of paper) located at the top of the webpage. A thorough list of topics will appear for users to choose from and examine. We want to take a look at sea level rise vulnerability, storm surge, existing wetlands and wetland adaptation areas. Each of these topics has its own layer named similarly.

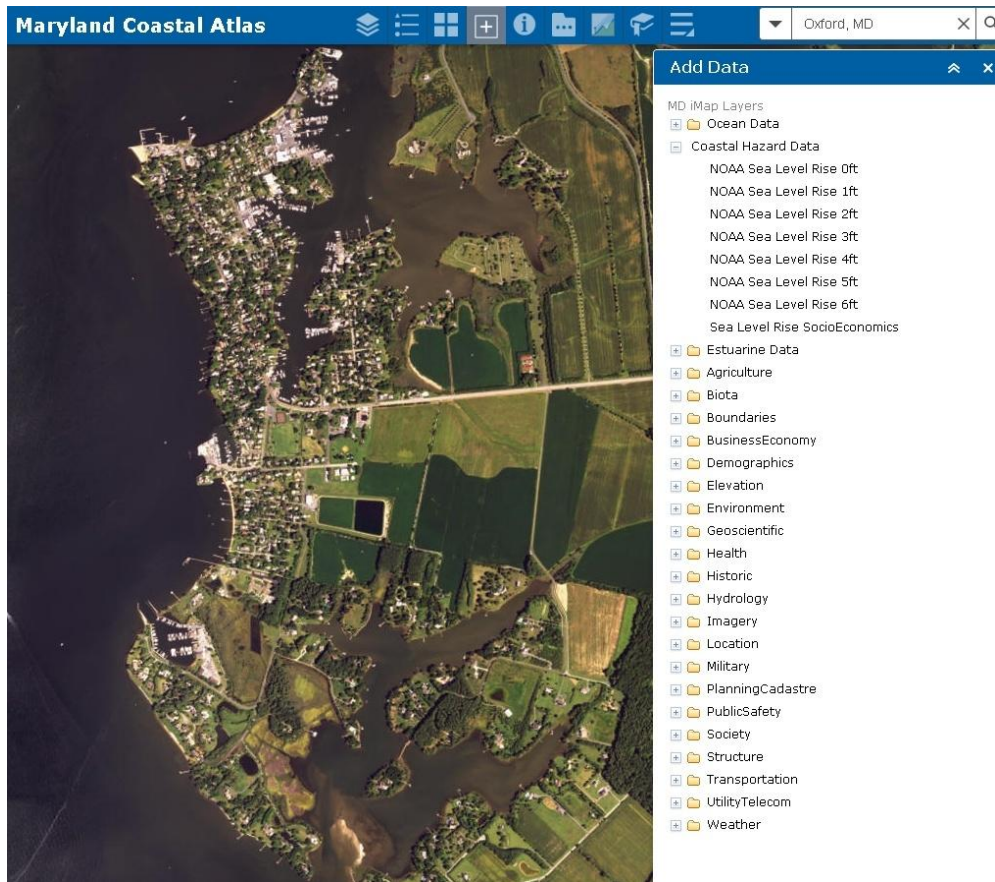


In order to see aerial imagery rather than street view, click on the "Basemap Gallery" icon (looks like a grid of four small squares) at the top of the webpage and select a preferred visual representation.



**Questions and Actions:**

- *Sea level rise vulnerability* – Navigate to the Sea Level Rise Vulnerability layer. Users can select projected sea level rise in increments of 0 to 2 feet, 2 to 5 feet and 5 to 10 feet. This information provides a visualization of the landward extent of sea levels at various degrees of rise and demonstrates which areas of a community will be affected by this change. If users prefer to see this information displayed in one-foot increments, they may do so by selecting the “Add Data” icon, navigating to the Coastal Hazard Data layer, and selecting the desired amount of sea level rise and clicking on the plus sign in the pop-up window. This data is provided by the National Oceanic and Atmospheric Administration (NOAA).



A 2013 study produced by the University of Maryland Center for Environmental Science and headed by Donald F. Boesch, *Updating Maryland's Sea-Level Rise Projections*<sup>2</sup>, provides best, low and high projections of Maryland relative sea level rise in 2050 and 2100. Experts involved in this study used the National Research Council's projections of global mean sea level rise, as well as the effects of land ice melt, thermal expansion, dynamic ocean effects and vertical land movement for their projections. For planning purposes, as of the date of this publication (2016) it is suggested that using the high sea level rise scenario of 2.1 feet in 2050 is appropriate to accommodate the higher estimates. If a project is intended to have a longer lifespan, use the 2100 estimates of between 3.7 and 5.7 feet of sea level rise. However, these projections will continue to be updated as research continues and planners should follow the most recent and best data available.

<sup>2</sup> Boesch, D.F., L.P. Atkinson, W.C. Boicourt, J.D. Boon, D.R. Cahoon, R.A. Dalrymple, T. Ezer, B.P. Horton, Z.P. Johnson, R.E. Kopp, M. Li, R.H. Moss, A. Parris, C.K. Sommerfield. 2013. *Updating Maryland's Sea-level Rise Projections*. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission, 22 pp. University of Maryland Center for Environmental Science, Cambridge, MD.

- *Storm surge* – Navigate to the Storm Surge layer. Add storm surge data in order to view community flooding induced by coastal storms of Category 1, 2, 3, 4 and 5. This information supplements community anecdotes of flooding and provides an idea of where to focus stormwater management efforts.

This layer can help predict the likelihood of flooding from major storm events. Category 2 is frequently used as a benchmark by the State, but with anticipated increases in frequency and severity of storms, this is likely to change.

- *Existing wetlands* – Navigate to the Wetlands layer to see wetlands that are part of your community's environment. Knowing where wetlands exist in a community is helpful in prioritizing goals of and approaches to coastal resiliency. For example, by identifying existing wetlands and observing the land uses and ownership around them, community planners can make decisions on conservation related to those areas. Wetlands are a natural form of green infrastructure that can enhance resiliency.
- *Wetland adaptation areas* – Navigate to the Sea Level Rise Wetland Adaptation Areas layer. This layer provides an approximation of locations where wetlands may most likely migrate as sea levels rise, and displays low, medium and high priority areas based on conservation criteria such as soil, habitat and migration barriers. Having this information is also useful for community planning efforts in that planners can try to avoid developing these areas, or to site stormwater management practices in or around them that would help ecosystems adapt as the area becomes inundated. The State focuses on medium and high priority areas for acquisition; these areas are important for maintaining habitat but also for protecting communities from erosion and flooding.
- Print the layers as described above, and circle areas of opportunity and threats to target.



Causeway and South Morris flooding, as viewed in Google Maps.

### Programmatic Assessment

A number of community ordinances and regulations, programs, and documents will play a role in developing a coastal resilience plan. However, starting with the Critical Area program will provide a good overview of where opportunities exist to make some changes that will lead to greater resilience. Anecdotal information is useful during this piece of the process as well. Again, town planners will have a better sense of which regulations work well and what could be improved, and that applies to the Critical Area program as well.

#### Questions and Actions:

- Review the community’s Critical Area ordinance and map.
- Where are the different designations of Intensely Developed Areas (IDA), Limited Development Areas (LDA) and Resource Conservation Areas (RCA) located in the community?
- Does the shoreline consist mostly of IDA and Modified Buffer Areas (MBA)?
  - Setbacks are a consideration for improving coastal resiliency in MBAs.
  - Stormwater management is an avenue for enhancing coastal resilience in shorelines consisting of IDA or MBA.

- If the shoreline is developed but is not designated MBA, does it qualify to do so? Consider working with the Critical Area Commission to have it designated as MBA.
- Or does the shoreline consist primarily of RCA?
- What do the RCAs look like and what function are they providing? Perhaps they are mostly forested, barren or used for agriculture. Is there any RCA located near the town that could be beneficial for this purpose?
  - For example, this could possibly be a mitigation site for redevelopment.
- Does the town implement any Fee-In-Lieu's (FILs)? For which activities?
  - FILs can provide built in flexibility, as well as funds for projects intended to enhance coastal resilience.
  - Pay attention to which activities require mitigation, the rates for each and their Critical Area designations.
- What kind of mitigation and planting is the town seeing for development and redevelopment?
  - Is mitigation only landscape trees?
  - Are there any issues tracking mitigation?
- Is there a lot of small development and redevelopment happening that doesn't require Environmental Site Design (ESD), and thus contributes to flooding?
  - Requiring a small, reasonable stormwater management practice for all development can help address nuisance flooding.
- Review Oxford's Case Study as an example.

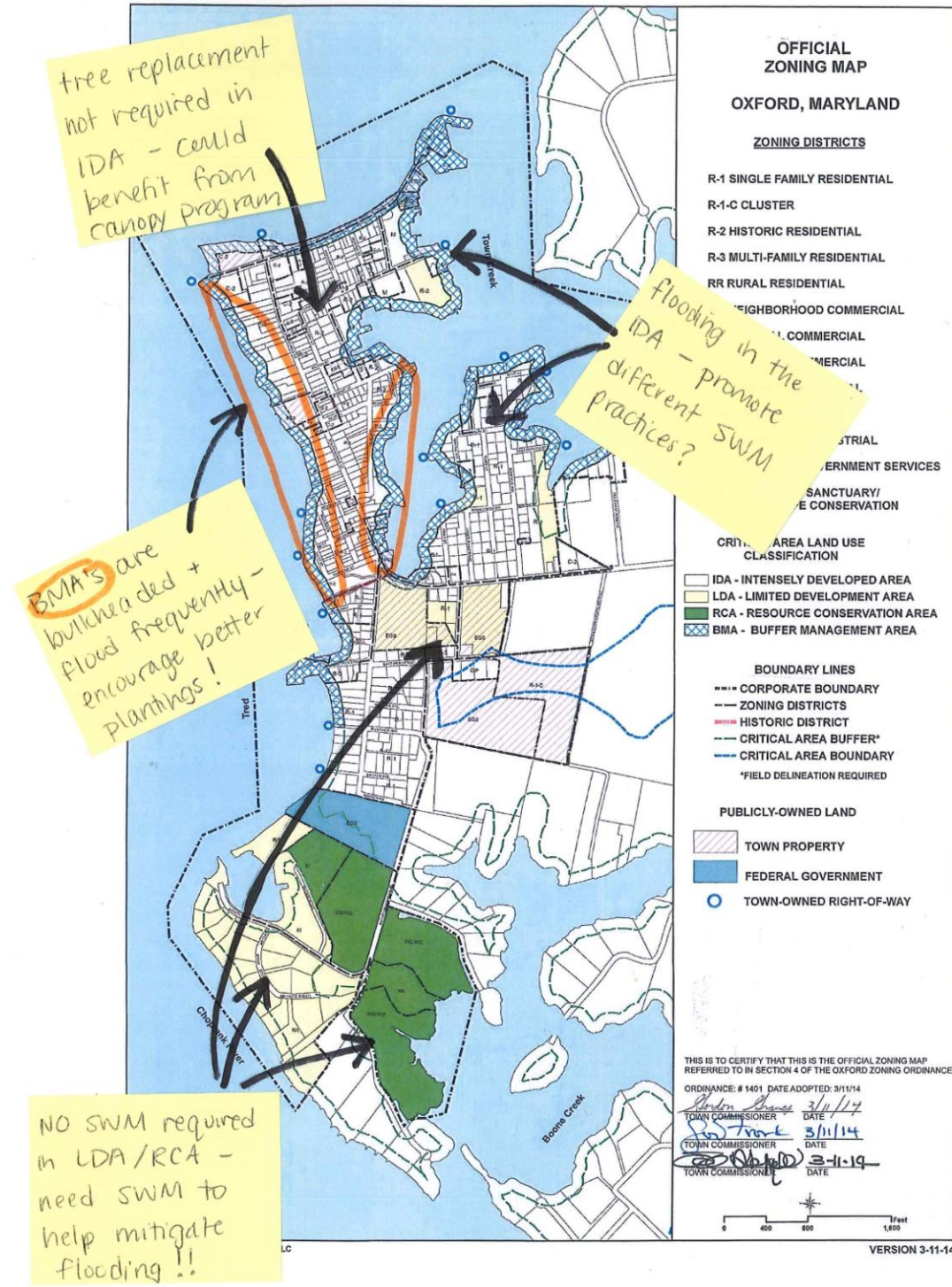


Photo credit: Cheryl Lewis. Residential flooding in Oxford, MD.



# Case Study: Oxford's Programmatic Assessment for Coastal Resiliency

## Zoning Ordinance and Map - Critical Area Overlay



The majority of the upper portion of Town is designated as Intensely Developed Area with Buffer Management Areas that are primarily bulkheaded. There are pockets of Limited Development Areas at the Town entrance (known as the Causeway), along the easternmost boundary, and near the northernmost part of town, in an area known as the Strand in the Historic District. The Federal government owns a portion of land near the middle/southern part of Town, partially adjacent to a wetland. Also in the southern area are greater amounts of Limited Development Area (already developed with single family homes) and Resource Conservation Area (wetland).

The IDA has stormwater requirements to reduce pollutant loadings by 10% for all development and redevelopment activities. However, these requirements are often met with landscape plantings that are note designed to provide stormwater management. The LDA and RCA designations require stormwater management for projects that disturb greater than 5,000 square feet. The majority of development and redevelopment projects in these designations disturb less than 5,000 square feet, and thus do not have to provide stormwater management. Both of these scenarios contribute to nuisance flooding issues in the community.

LDA standards include a 15% lot coverage limitation (or greater for smaller lots), and a forest and developed woodlands clearing limitation of 20%, to be mitigated at a 1:1 ratio. When clearing is 20-30%, mitigation is required at a 1.5:1 ratio, and over 30% is a 3:1 ratio. Given the limited areas of LDA and RCA, forest clearing and mitigation requirements have been easily met. Like most Critical Area jurisdictions other than the Coastal Bays, mitigation is not required for clearing in the IDA. The Town would like to protect mature trees if possible, but without adding a significant burden to property owners.

RCA standards are the same as those for LDA, with the addition of a density requirement of no more than 1 dwelling per 20 acres. The Critical Area Overlay of the Zoning Ordinance also includes a discussion of permitted uses for the designations, and supplemental standards for new and existing uses of a property.

A fee-in-lieu exists for when an applicant cannot provide the required stormwater management or plantings due to site constraints. This fee is collected at a rate of \$1.50 per square foot of required mitigation. The Town has not had to collect a significant amount of fee-in-lieu over the years.

There is also a section regarding Growth Allocation, in which RCA and LCA may change classification and management. Up to five percent of the RCA acreage in Oxford may be converted.

Mitigation must be provided for impacts to the 100 foot Buffer and to Buffer Modified Areas. Most areas of the Buffer within Town are designated as BMA. The redevelopment standards generally require landscape plantings, which are often met on site. Most of the remaining properties that are not designated as BMA are already developed and Buffers are generally protected.

*Based on this assessment in addition to geographic and anecdotal information, the Town decided to pursue strategies to address stormwater for development less than 5,000 square feet, urban canopy trees, and BMA shorelines.*

## **STRATEGIES & IMPLEMENTATION CONSIDERATIONS**

Our Critical Area regulations afford the flexibility to make some desired changes as long as they are at least as effective as existing regulations. By completing the anecdotal, geographic and programmatic assessments, users of this guide have gathered information regarding what kind of coastal concerns currently exist, what may be a threat in the future, and how well Critical Area regulations are working, or need improvement. This section discusses possible strategies to address coastal hazards through local Critical Area amendments. These ideas can be applied in various Critical Area designations, and are most effective when adopted as a program rather than piecemeal. In order to implement the selected strategies, communities must draft amendments to their local Critical Area programs. Opportunities for coastal resilience are not limited to these suggestions, however; creativity and an open mind are important in identifying new areas of opportunity!

### **Stormwater Management**

Stormwater management is already required by the State of Maryland in the form of the Maryland Department of the Environment's Environmental Site Design (ESD) for projects that disturb greater than 5,000 square feet, and by the Critical Area Commission for 10% pollutant reductions in the IDA. The Critical Area Commission requires stormwater management for projects disturbing greater than 250 square feet. For residential projects, this translates to landscape plantings, which do not generally affect stormwater quantity. In communities that are already well established, and where development and redevelopment projects are relatively small, stormwater management is often not provided and thus the project contributes to cumulative impacts such as nuisance flooding.

One strategy to combat this issue is to implement small best management practices for these lesser development projects. The following table is an example of how simple this solution can be. When someone applies for a building permit, the town planner can help them review options that would work best for them. This selection is based on the amount of permanent disturbance from the project. Appropriate size specifications are provided. This strategy is most effective if applied in all Critical Area designations and if stormwater management is provided on-site, rather than providing property owners with the option of paying a fee-in-lieu.

In this example, disturbance less than 250 square feet and in-kind replacement are exempt.

<b>Permanent disturbance threshold</b>	<b>250 - 500 sf</b>	<b>501 - 1000 sf</b>	<b>1001 - 2000 sf</b>	<b>2001 - 3000 sf</b>	<b>3001 - 4000 sf</b>	<b>4001 - 5000 sf</b>
<b>Rain garden minimum size requirements</b>	50 sf sa, 0.5 ft pd, 1.0 ft md	75 sf sa, 0.5 ft pd, 1.0 ft md	total of 150 sf sa, 0.5 ft pd, 1.0 ft md	total of 250 sf sa, 0.5 ft pd, 1.0 ft md	total of 350 sf sa, 0.5 ft pd, 1.0 ft md	total of 450 sf sa, 0.5 ft pd, 1.0 ft md
<b>Bioswale minimum size requirements</b>	50 sf sa, 0.5 ft pd, 1.0 ft md	75 sf sa, 0.5 ft pd, 1.0 ft md	total of 150 sf sa, 0.5 ft pd, 1.0 ft md	total of 250 sf sa, 0.5 ft pd, 1.0 ft md	total of 350 sf sa, 0.5 ft pd, 1.0 ft md	total of 450 sf sa, 0.5 ft pd, 1.0 ft md

sf = square feet; sa = surface area; pd = ponding depth; md = media depth

Size Requirements are as follows:

- The surface area of a practice is essentially the size of the practice and how much space it will occupy on a property.
- Ponding depth indicates the depth to the planting media, which determines how much water can be stored. A greater volume of stormwater is captured with deeper ponding.
- Media depth is how deep the planting media is in the ground, and a greater media depth also allows for greater stormwater storage.

**Rain gardens** are landscaped depressions that capture and treat stormwater runoff. They contain soil and herbaceous plants, allowing pollutant removal by the slow infiltration of runoff. A single site will often use several rain gardens.

**Bioswales** are typically linear landscaped depressions that include layers of soil, gravel and vegetation as well as a drainage pipe underneath. They are often located along roadways. They pond and filter stormwater.

**Rain barrels** could be used in conjunction with rain gardens and bioswales. One standard barrel, with a minimum capacity of 50 gallons, offsets the stormwater from about 100 square feet.

These small best management practices are manageable enough for property owners to implement themselves. However, a community may want to consider having a single company or organization spend a day or two helping all the property owners at once put these practices in the ground and demonstrate how to maintain them.

To help decide if this strategy would be useful and appropriate for a community, consider the following questions and actions:

- How does the community currently handle stormwater management? Are requirements being met?
- How could the community do better with stormwater management? For example, are there a lot of small development projects with no stormwater management?
- Investigate soil type. The community may just need guidance and educational materials on the practices that would work best in their community and what homeowners could reasonably do themselves.

### **Additional Resources**

- Blue Water Baltimore, <http://www.bluewaterbaltimore.org/>
- Low Impact Development Center, <http://www.lowimpactdevelopment.org/>
- Chesapeake Bay Foundation, <http://www.cbf.org/document.doc?id=164>
- University of Maryland Extension, <https://extension.umd.edu/watershed>

### **Tree Replacement/Strategic Planting & Management**

If your community doesn't have an urban tree canopy program already, it may want to consider this next strategy for the IDA. Native mature trees can capture some stormwater, help secure soil with its roots and enhance the heating and cooling efficiency of nearby homes. Another resiliency strategy is to implement a tree replacement program, specifically in the IDA where mitigation for individual tree removal is not currently required. When a tree is removed, the community could require

mitigation at a reasonable replacement ratio; an example table is displayed below. The replacement tree should be a native species.

<b>Diameter at breast height (DBH) of removed tree</b>	<b>Planting Requirement</b>
Less than ten inches	One tree
Between ten and sixteen inches	Two trees
Greater than sixteen inches	Three trees

Alternatively, a fee-in-lieu could be collected instead of a tree planted on-site. This provides some flexibility to property owners who cannot plant on-site or wish not to. Fees collected for this purpose would provide for the planting of a tree elsewhere in the community's Critical Area, in a location selected based upon the geographic assessment. It should be a public location that contributes to the protection of a more vulnerable area or a riparian area prone to flooding.

Consider the following questions while deciding if this concept could be beneficial to your community:

- Is there already a tree replacement program, such as an urban tree canopy program? If not, could the community benefit from one?
- Would it be more beneficial to collect FILs for trees removed and replant in a location that would better serve areas in the community that are threatened by coastal hazards?

#### Additional Considerations

- An alternative to the tree replacement program is to use FILs of trees planted on site in order to naturally restore a property that could help enhance resiliency through its protection.
- Review ownership of properties of interest. It may be necessary for the town to purchase a property in need of natural restoration.

## Resilient Modified Buffer Areas

Some shorelines of the Critical Area have an additional designation of Modified Buffer Area (MBA; or sometimes Buffer Exempt Area (BEA) or Buffer Management/Modification Area (BMA)). In these areas, the regulations acknowledge the challenges posed by shorelines that were already dominated by heavy development at the time of program adoption. Mitigation is required when developing in these areas, but often that mitigation results in traditional landscaping that does little to protect threatened shorelines. Shorelines vegetated with native species that have deep and broad reaching root structures and that can handle salt water and sandy and nutrient-deficient soil are more resilient than lawns with landscaping.

One way to implement this concept is to keep the existing mitigation calculations for development in a MBA but require a set of specific planting standards regarding species and location. For example, require planting from an appropriate list of grasses and shrubs in the first five feet landward from the shoreline, with any remaining mitigation located in the first 25 feet landward from the shoreline. Water access can be provided and plants can be arranged to maintain the viewshed. Property owners can also maintain lawn areas up to these more natural edges, thus enabling them to have full use of their property. The Critical Area Commission has provided some sample plans for various shorelines with examples of species and arrangements.

<b>Vegetation Type</b>	<b>Minimum Size</b>	<b>Maximum Credit Allowed (square feet)</b>
Herbaceous perennial	1 quart or based on area covered by plugs or seed mix	2
Small Shrub	18 inches high	25
Large Shrub	3 feet high	50

When bulkheads, lawns and storm surge combine, there is a threat to the property because there is no stability of the shoreline during storm events. Bulkheads are not flexible to strong surges, and the shallow roots of a lawn do not adequately hold soil in place. This option encourages resilience along the shore with deep rooted species.

Review the following actions and questions while selecting resiliency strategies for your community:

- Are the areas of shorelines designated as MBA mostly residential? Are they lawn, and are they bulkheaded or natural?
- Are commercial areas designated MBA?
- Consider the current state of the community's buffers. Are they already fully established, or are they sparse and prone to erosion?
- How much activity happens in BMAs? Would they benefit from alternative planting requirements?
- Should property owners be given options to do a combination of planting trees as usual along with new planting alternatives of shrubs and grasses?

### **Encouragement of Pervious Pavers in the IDA**

Another strategy to improve coastal resilience is by encouraging smarter development decisions, such as using pervious pavers rather than traditional solid concrete walkways and driveways. Pervious pavers manage stormwater by allowing the movement of stormwater directly through the paving material into a temporary storage area, while trapping pollutants and sediments in the process.

Within the Critical Area, lot coverage allowances for the LDA and RCA are established by the General Assembly. Some communities limit the footprint of development in the IDA, a strategy not required by the Critical Area law. There may be opportunities working with the Commission to adjust requirements to encourage property owners to use these surfaces.

The following questions can assist planners in determining if this is a strategy they would like to pursue for their community:

- Is there an impervious cover or lot coverage limit in the IDA? What about outside of the Critical Area?
- Is there desire to use these surface alternatives, and will property owners appropriately maintain them?





Photo credit: Alex DeWeese. An example of pervious pavers in Oxford, MD.

## **A FINAL NOTE**

Even if a community elects to use all of these suggested strategies, total protection from future coastal hazards is not an anticipated outcome. We recognize that there are limitations to what these strategies can do, and that each piece to the puzzle has minimal effect on an entire community. However, these strategies can have a collective positive impact on the community, and will help address coastal hazards into the future. The topic of coastal resiliency will continue to evolve as scientists and specialists learn and experiment more; following this outline and implementing some of the strategies will put communities in a good place to continue evolving for the better as well!

Critical Area Commission staff is available to help provide additional guidance and assistance. If you are interested in pursuing specific changes to your Critical Area program, or you just want to learn more please contact us at <http://dnr.maryland.gov/criticalarea>